

Application Serial No. 10/550,577
Reply to Office Action of August 4, 2008

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Docket: CU-6554

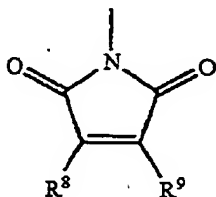
Amendments to the Claims

The listing of claims presented below replaces all prior versions, and listings, of claims in the application.

Listing of claims:

1. (Currently amended) A curable resin composition for forming a photosensitive pattern comprising:
 - a copolymer (a) having a polymer chain molecular structure in which a constitutional unit including at least a repeating unit having an acidic functional group and a constitutional repeating unit including a photocurable functional group are linked at least,
 - a photopolymerization initiator (b) having a tertiary amine structure; and
 - a photocurable compound (c) having at least one acidic functional group and at least three photocurable functional groups wherein the photocurable functional groups are photoradical polymerizing functional groups;
 - wherein the curable resin composition may contain a photocurable compound (d) having at least two photocurable functional groups with the proviso that the photocurable compound (d) is other than the photocurable compound (c);
 - wherein the copolymer (a) is an imide group containing copolymer (a1) containing a constitutional unit including a cyclic imide group represented by a following formula (19), as the constitutional unit including the photocurable functional group;

Formula (19)



wherein each of R8 and R9 is an alkyl group having 4 or less carbon atoms independently, or one of R8 and R9 is a hydrogen atom and the other is an alkyl group having 4 or less carbon atoms, or both R8 and R9 together form a carbon ring;

wherein a content of copolymer (a1) is in the range of 5 to 40% by weight, on the basis of solid content; and

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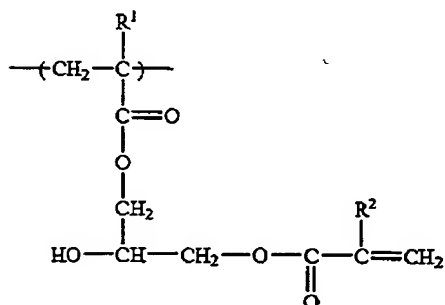
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wherein a solid content weight ratio ((a1) / (c)) of the imide group containing copolymer (a1) to the photocurable compound (c) in a case that the curable resin composition includes no photocurable compound (d) with the proviso that the photocurable compound (d) is other than the photocurable compound (c), or a solid content weight ratio ((a1) / {(c) + (d)}) of the imide group containing copolymer (a1) to a total of the photocurable compound (c) and the photocurable compound (d) in a case that the curable resin composition includes the photocurable compound (d), is 0.7 or less.

2. (Cancelled)

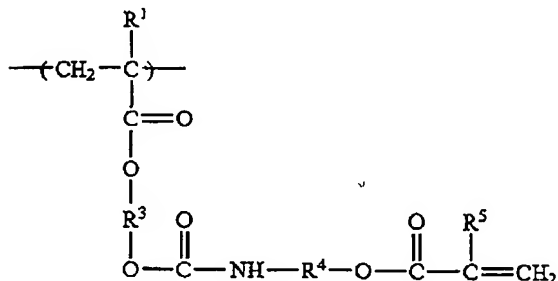
3. (Withdrawn) The curable resin composition according to claim 1, wherein the copolymer (a) includes a constitutional unit represented by a following formula (1) and/or a constitutional unit represented by a following formula (2), as the constitutional unit having the photocurable unit:

Formula (1)



wherein R1 is a hydrogen atom or an alkyl group having 1 to 5 carbon atoms, and R2 is a hydrogen or a methyl group;

Formula (2)



wherein R1 is the same as defined above, R3 is an alkylene group having 2 to 4

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carbon atoms, R4 is an alkylene group, and R5 is a hydrogen atom or a methyl group.

4. (Withdrawn) The curable resin composition according to claim 1, wherein the copolymer (a) has a molecular weight of 3,000 to 1,000,000.

5. (Cancelled)

6. (Withdrawn -- currently amended) The curable resin composition according to claim [[5]] 1, wherein a weight ratio $((a) / \{(c) + (d)\})$ of the copolymer (a) to a total of the photocurable compound (c) and the photocurable compound (d) is up to 1.5, on the basis of solid content.

7. (Withdrawn) The curable resin composition according to claim 1, wherein the photopolymerization initiator (b) having the tertiary amine structure is contained at least 10% by weight, on the basis of solid content.

8. (Withdrawn) The curable resin composition according to claim 1, wherein the curable resin composition is used for fabricating a liquid crystal panel substrate.

9. (Withdrawn) A liquid crystal panel substrate comprising:
a transparent substrate; and
a color layer disposed on the transparent substrate,
the liquid crystal panel substrate optionally comprising:
a protective film for covering the color layer; and/or
a spacer disposed in a non-display region on the substrate, wherein
at least one of the protective film and the spacer is formed by
curing the curable resin composition according to claim 1.

10. (Withdrawn) A liquid crystal panel comprising:
a display side substrate;
a liquid crystal driving side substrate opposite to the display side

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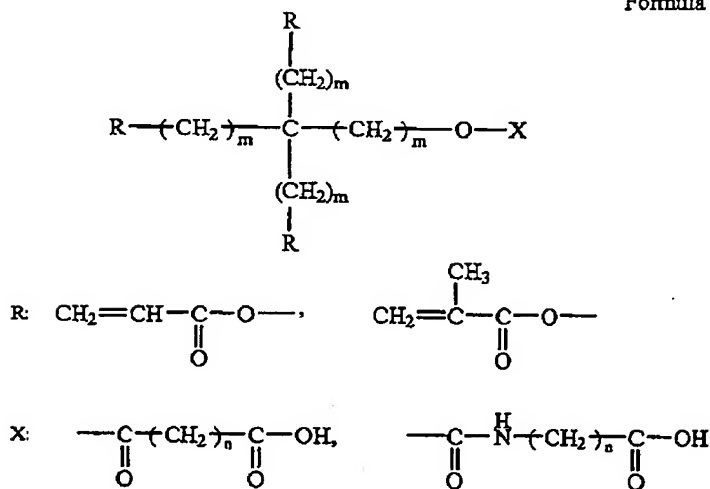
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substrate; and

a liquid crystal filled and sealed between these two substrates, wherein at least one of the display side substrate and the liquid crystal driving side substrate is the liquid crystal panel substrate according to claim 9.

11. (Withdrawn) The curable resin composition according to claim 1, wherein the photocurable compound (c) is an acidic group containing monomer (c3) represented by a following formula (11):

Formula (11)



wherein each of m and n is an integer equal to 1 or more than 1, independently.

12. (Withdrawn) The curable resin composition according to claim 11, capable of forming a convex pattern having a lower area S1 and an upper area S2 satisfying a relationship $S2 \leq S1$, in processes including: forming a coating film and subjecting the coating film sequentially to a selective exposure and an alkali developing treatment.

13. (Withdrawn) The curable resin composition according to claim 11, further comprising a photocurable compound (d) having at least two photocurable functional groups with the proviso that the photocurable compound (d) is other than the photocurable compound (c).

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14. (Withdrawn) The curable resin composition according to claim 11, further comprising at least one kind of colorant (e), wherein a weight ratio ((e) / (c3)) of the colorant (e) acidic group containing monomer (c3) to the acidic group containing monomer (c3) satisfies a relationship $0.3 < (e) / (c3) < 0.6$.

15. (Withdrawn) A color filter comprising:
a transparent substrate; and
a color layer disposed on the transparent substrate,
the color filter optionally comprising:
a protective film for covering the color layer; and/or
a spacer disposed in a non-display region on the transparent substrate, wherein
at least one of the color layer, the protective film and the spacer is formed by curing the curable resin composition according to claim 11.

16. (Withdrawn) A liquid crystal panel substrate having a plurality of spacers disposed in a non-display region on a substrate, wherein the spacers are formed by curing the curable resin composition according to claim 11.

17. (Withdrawn) A liquid crystal panel comprising:
a display side substrate;
a liquid crystal driving side substrate opposite to the display side substrate; and
a liquid crystal filled and sealed between these two substrates, wherein the display side substrate is the color filter according to claim 15.

18. (Withdrawn) A liquid crystal panel comprising:
a display side substrate;
a liquid crystal driving side substrate opposite to the display side substrate; and
a liquid crystal filled and sealed between these two substrates, wherein the liquid crystal driving side substrate is the liquid crystal

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panel substrate according to claim 16.

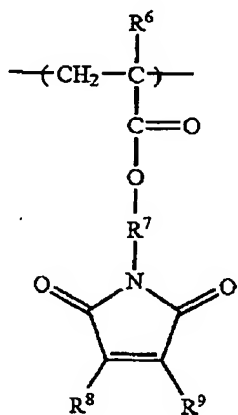
19. (Cancelled)

20. (Currently amended) The curable resin composition for a use of forming a photosensitive pattern according to claim 1 [[19]], wherein the imide group containing copolymer (a1) further contains a constitutional unit including another photocurable functional group other than the cyclic imide group.

21. (Currently amended) The curable resin composition for a use of forming a photosensitive pattern according to claim 20 [[19]], wherein the photocurable functional group other than the cyclic imide group of the constitutional unit of the imide group containing copolymer (a1) is contains an ethylenically unsaturated bond as a photocurable functional group other than the cyclic imide group.

22. (Currently amended) The curable resin composition for a use of forming a photosensitive pattern according to claim 1 [[19]], wherein the imide group containing copolymer (a1) contains a constitutional unit represented by a following formula (21) as the constitutional unit including the cyclic imide group and a constitutional unit represented by a following formula (3) as the constitutional unit including the acidic functional group:

Formula (21)

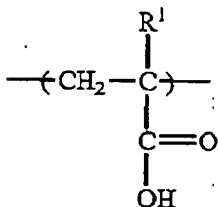


wherein R6 is a hydrogen atom or an alkyl group having 1 to 5 carbon atoms, R7 is an alkylene having 1 to 6 carbon atoms, R8 and R9 are the same as defined above;

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Formula (3)



wherein R1 is a hydrogen atom or an alkyl group having 1 to 5 carbon atoms.

23. (Currently amended) The curable resin composition for a use of forming a photosensitive pattern according to claim 1 [[19]], wherein the imide group containing copolymer (a1) contains an alcoholic hydroxy group in its molecule.

24. (Currently amended) The curable resin composition for a use of forming a photosensitive pattern according to claim 1 [[19]], wherein an elastic deformation modulus ~~[(elastic deformation amount / total deformation amount) X 100]~~ against a compressive load of 2.0 GPa exhibits at least 60% at a room temperature after curing, wherein the elastic deformation modulus is defined as an elastic deformation amount / a total deformation amount x 100.

25. (Cancelled)

26. (Currently amended) The curable resin composition for a use of forming a photosensitive pattern according to claim 1 [[25]], wherein the photocurable compound (d) (other than the compound (C)) contains at least three ethylenically unsaturated bonds as the photocurable functional group, and contains an alcoholic hydroxy group.

27. (Cancelled)

28. (Currently amended) The curable resin composition for a use of forming a photosensitive pattern according to claim 1 [[19]], wherein the photopolymerization initiator (b) having the tertiary amine structure is contained at 0.05 to 5% by weight, on the basis of solid content.

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29. (Currently amended) The curable resin composition for a use of forming a photosensitive pattern according to claim 1 [[19]], wherein the curable resin composition is used for fabricating a liquid crystal panel substrate.

30. (Currently amended) A liquid crystal panel ~~substrata~~ substrate comprising:
a transparent substrate; and
a color layer disposed on the transparent substrate,
the liquid crystal panel substrate further comprising:
a protective film for covering the color layer; and/or
a spacer disposed in a non-display region on the substrate, wherein at least one of the protective film and the spacer is formed by curing the curable resin composition according to claim 1 [[19]].

31. (Currently amended) The liquid crystal panel substrate according to claim 30, wherein the spacer has at least 60% of an elastic deformation modulus $\{(\text{elastic deformation amount} / \text{total deformation amount}) \times 100\}$ against a compressive load of 2.0 GPa at a room temperature, wherein the elastic deformation modulus is defined as an elastic deformation amount / a total deformation amount x 100.

32. (Previously presented) A liquid crystal panel comprising:
a display side substrate;
a liquid crystal driving side substrate opposite to the display side substrate; and
a liquid crystal filled and sealed between these two substrates, wherein at least one of the display side substrate and the liquid crystal driving side substrate is the liquid crystal panel substrate according to claim 30.

33. (Withdrawn) The curable resin composition according to claim 1, wherein the composition further comprises a colorant (e) and is used for forming a colorant pattern.

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34. (Withdrawn) The curable resin composition for forming the colorant pattern according to claim 33, further comprising a photocurable compound (d) (other than the compound (c)) having at least two photocurable functional groups.
35. (Withdrawn) The curable resin composition for forming the colorant pattern according to claim 33, containing the photocurable compound (c) of 3 to 30% by weight, on the basis of solid content.
36. (Withdrawn) The curable resin composition for forming the colorant pattern according to claim 33, wherein the photopolymerization initiator (b) having the tertiary amine structure is contained at least 5% by weight, on the basis of solid content.
37. (Withdrawn) The curable resin composition for forming the colorant pattern according to claim 33, wherein the copolymer (a) has a molecular weight of 3,000 to 1,000,000.
38. (Withdrawn) The curable resin composition for forming the colorant pattern according to claim 33, wherein the curable resin composition is used for forming a colorant pattern for a color filter.
39. (Withdrawn) A color filter comprising:
a transparent substrate; and
a pixel disposed on the transparent substrate,
the color filter optionally comprising:
a black matrix layer,
wherein
the pixel and/or the black matrix layer are formed by curing the curable resin composition according to claim 33.
40. (Withdrawn) A liquid crystal panel comprising:
a display side substrate;
a liquid crystal driving side substrate opposite to the display side

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substrate; and

a liquid crystal filled and sealed between these two substrates, wherein
the display side substrate is the color filter according to claim 39.